

2.7 CCLME - Salmon - Central and Northern region: Ocean data and models for the central CC (11:55-12:20, Tues. April 19)

Speaker: Brian Wells, SWFSC

Outline

- I. To quantify the affect that freshwater management has on salmon production the functional relationships between the ocean conditions and salmon vital rates is necessary. Freshwater management acts on size, abundance and emigration timing of juveniles to sea. Therefore, these life-history parameters need to be examined in the context of the ocean conditions.
- II. Basin-scale conditions precondition California central coast for the amount of primary, secondary and tertiary production in the spring
 - a. Central California has the greatest abundance of salmon prey on the shelf in California and Oregon
 - b. The size and position of the North Pacific High pressure cell in winter relates to production on the shelf through winter and into spring on the central California shelf.
- III. During spring Chinook salmon emigrate to the sea. The forage base present at that time will depend on prior nutrient introduction and retention.
 - a. Krill and juvenile rockfish are critical prey items for juvenile salmon
 - b. The strength and duration of upwelling and transport over the shelf and shelf break in winter is related to prey abundances on the shelf in spring.
- IV. Salmon survival has been linked to spatial and temporal patterns of the prey field and the dynamics of salmon predators
 - a. Salmon that emigrate to sea approximately 100 days after initial upwelling have a greater probability of survival. This is the time required for the development of krill populations on the shelf and for juvenile rockfishes to be transported onto shelf.
 - b. Condition of salmon is positively associated with krill and rockfish.
 - c. If prey are not available on shelf as salmon emigrate to sea they are smaller and prone to increased predation.
- V. Biophysical models have been developed to test and model these dynamics.
 - a. Models confirm conceptual model of the ecosystem dynamics
 - b. Models can be linked to estuarine and freshwater models to complete the life-cycle simulations.

Background reading:

- Fiechter, J., D.D. Huff, B.T. Martin, D. Jackson, C.A. Edwards, K.A. Rose, E.N. Curchitser, K.S. Hodstrom, S.T. Lindley, and B.K. Wells. 2015. Environmental conditions impacting juvenile Chinook salmon growth off central California: an ecosystem model analysis. *Geophysical Research Letters*. 42:2910-2917
- Wells, B.K., J.A Santora, I.D. Schroeder, W.J. Sydeman, N. Mantua, D.D. Huff, J.C. Field. *Accepted with revision*. Ecosystem perspectives on Chinook salmon recruitment: A synthesis of empirical and modeling studies from the California upwelling system. *Marine Ecology Progress Series*.